

Navy Case No. 79,693

In the United States Patent and Trademark Office

In re: Bayya et al
Serial No.: 09/699,396
Filed: October 31, 2000
For: Method For Coating
Small Particles

Examiner: Michael B. Cleveland
Art Unit: 1762
Date: June 20, 2005

Request for Rehearing

Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20230:

Sir:

This is a request for reconsideration of the decision of the Board of Patent Appeals and Interferences that was mailed April 20, 2005.

All rejections of the appealed claims include the Peterson reference. At bottom of p. 5 of the Board decision, gelation is incorrectly equated with precipitation. Precipitation is not gelation and each appealed claim, directly or indirectly, is limited by the clause "whereby the precursor is not precipitated until after spraying." The limitation uses the term "precipitated" not "gelled," which yields a particulate product that has a lifetime in excess of 10,000 hours of continuous operation without losing 50% of the original brightness. The coated particles are phosphor particles, as recited, for

instance, in claims 11 and 18, that is used in field emission displays.

There is nothing in the Peterson reference, in col. 6 or in any other part, nor in any other cited reference, to suggest forestalling precipitation of the precursor on the particles until after spraying of the particles and it would not be obvious to do so.

At top of p. 6 of the Board's decision, it is noted in the Strom reference that precipitation is avoided in the solution before spray drying by adding nitric acid to the solution, however, the Board agreed with the Examiner that the reference does not discuss why precipitation is avoided. The question is then if and to what extent the Strom reference remains as a reference and how is it used in the rejection.

In paragraph bridging pp. 7 and 8 of the Feb. 6, 2003, Amendment After Final Rejection, there is no admission that gelation is equivalent to precipitation. All the paragraph states is that urea and carbohydrazide are agents that can promote gelation; or that the same agents can promote precipitation.

At top of p. 12 of the specification, parameters, such as temperature or pH, are listed as preventing or discouraging precipitation on the surface of the particle. Which reference is supposed to teach or suggest such delay of precipitation?

The Board admonishes Appellants at about the middle of p. 7 of its decision in that a rejection premised on a combination of references cannot be overcome by attacking the references individually. Appellants appreciate this but they do not attack any of the applied references individually knowing that an obviousness rejection, based in a combination of references, must render the claimed subject matter obvious to a person skilled in the art. However, all of the obviousness rejections herein are based on at least 4 references and some are based on as many as 8, so that the obviousness decision is based on hindsight knowledge of the claimed subject matter, which is contrary to the concept of obviousness.

All of the appealed art rejections are based on obviousness. As was already argued, none of the appealed rejections render obvious the herein-claimed subject matter which is characterized by the clause "whereby the precursor is not precipitated until after spraying." It is only on the basis of hindsight knowledge of the herein-claimed subject matter that such a conclusion could be made.

On the issue of gelation and precipitation, please consider the text entitled "Sol-Gel Science" authored by Drs. Brinker and Scherer. Enclosed is a copy of the title page and p. 8 of the text. As noted, for instance, on p. 8 of the text,

"... a gel is a continuous solid skeleton enclosing a continuous liquid phase."

Also enclosed is a copy of the title page of the text entitled "Principles of Chemistry" authored by Drs. Davis, Gailey and Whitten and p. 296 of the text. At bottom of p. 296, it is noted that

"Precipitation reactions are common kind of metathesis reaction in which one of the products is an insoluble solid, called precipitate, which separates from solution."

The above-noted authoritative texts discuss the separate and distinct character of gels and precipitates, which should dispel any equivalence of the two.

Enclosed is a request for extension of time. Please charge any fee due hereunder to our account 50-0281

Respectfully submitted,
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SOL-GEL SCIENCE

The Physics and Chemistry of
Sol-Gel Processing

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If a monomer can make more than two bonds, then there is no limit on the size of the molecule that can form. If one molecule reaches macroscopic dimensions so that it extends throughout the solution, the substance is said to be a *gel*. The *gel point* is the time (or degree of reaction) at which the last bond is formed that completes this giant molecule. Thus a gel is a substance that contains a continuous solid skeleton enclosing a continuous liquid phase. The continuity of the solid structure gives elasticity to the gel (as in the familiar gelatin dessert). Gels can also be formed from particulate sols, when attractive dispersion forces cause them to stick together in such a way as to form a network. The characteristic feature of the gel is obviously not the type of bonding: polymeric gels are covalently linked, gelatine gels form by entanglement of chains, and particulate gels are established by van der Waals forces. The bonds may be reversible, as in the particulate systems (which can often be redispersed by shaking), or permanent, as in polymeric systems. What exactly is or is not a gel? As noted by Henisch [5], a gel "has been defined as a 'two-component system of a semisolid nature, rich in liquid,' and no one is likely to entertain illusions about the rigor of such a definition." What is semisolid? That restriction would help to eliminate porous sandstone from the category of gels, but it would also seem to eliminate silica gel, which can be quite rigid. We interpret a gel to consist of continuous solid and fluid phases of colloidal dimensions. Continuity means that one could travel through the solid phase from one side of the sample to the other without having to enter the liquid; conversely, one could make the same trip entirely within the liquid phase. Since both phases are of colloidal dimension, a line segment originating in a pore (which may be filled with liquid or vapor) and running perpendicularly into the nearest solid surface must re-emerge in another pore less than $1 \mu\text{m}$ away. (See Fig. 4.) Similarly, a segment originating within the solid phase and passing perpendicularly through the pore wall must re-enter the solid phase within a distance of $1 \mu\text{m}$.

The formation of gels and the effect of gelation on the properties of the parent sol are discussed in detail in Chapter 5. It is generally found that the process begins with the formation of fractal aggregates that grow until they begin to impinge on one another, then those clusters link together as described by the theory of *percolation*. That is, near the gel point bonds form at random between the nearly stationary clusters (polymers or aggregates of particles), linking them together in a network. The gel point corresponds to the *percolation threshold*, when a single cluster (called the *spanning cluster*) appears that extends throughout the sol; the spanning cluster coexists with a sol phase containing many smaller clusters, which gradually become attached to the network. Gelation can occur after a sol is cast into a mold, in which case it is possible to make objects of a desired shape. If the smallest dimension of the gel is greater than a few millimeters, the object is generally

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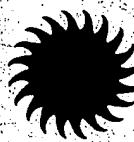


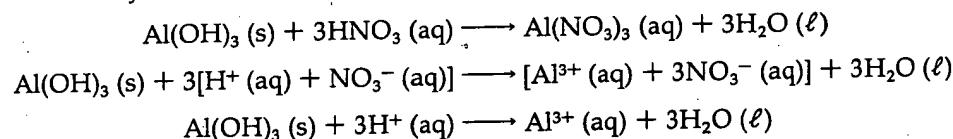
TABLE 9-6 Amphoteric Hydroxides

Metal or Metalloid.Ions	Insoluble Amphoteric Hydroxide	Complex Ion Formed in an Excess of a Strong Soluble Base
Be^{2+}	$\text{Be}(\text{OH})_2$	$[\text{Be}(\text{OH})_4]^{2-}$
Al^{3+}	$\text{Al}(\text{OH})_3$	$[\text{Al}(\text{OH})_4]^-$
Cr^{3+}	$\text{Cr}(\text{OH})_3$	$[\text{Cr}(\text{OH})_4]^-$
Zn^{2+}	$\text{Zn}(\text{OH})_2$	$[\text{Zn}(\text{OH})_4]^{2-}$
Sn^{2+}	$\text{Sn}(\text{OH})_2$	$[\text{Sn}(\text{OH})_3]^-$
Sn^{4+}	$\text{Sn}(\text{OH})_4$	$[\text{Sn}(\text{OH})_6]^{2-}$
Pb^{2+}	$\text{Pb}(\text{OH})_2$	$[\text{Pb}(\text{OH})_4]^{2-}$
As^{3+*}	$\text{As}(\text{OH})_3$	$[\text{As}(\text{OH})_4]^-$
Sb^{3+*}	$\text{Sb}(\text{OH})_3$	$[\text{Sb}(\text{OH})_4]^-$
Si^{4++*}	$\text{Si}(\text{OH})_4$	SiO_4^{4-} and SiO_3^{2-}
$\text{Co}^{2+†}$	$\text{Co}(\text{OH})_2$	$[\text{Co}(\text{OH})_4]^{2-}$
$\text{Cu}^{2+†}$	$\text{Cu}(\text{OH})_2$	$[\text{Cu}(\text{OH})_4]^{2-}$

As, Sb, and Si are metalloids.

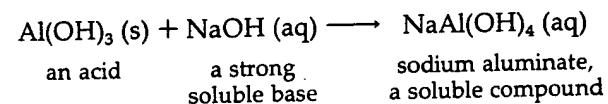
† Co(OH)_2 and Cu(OH)_2 are only slightly amphoteric; a very large excess of strong soluble base is required to dissolve small amounts of these insoluble hydroxides.

Aluminum hydroxide is a typical amphoteric metal hydroxide. Its behavior as a base may be illustrated by its metathesis reaction with nitric acid to form a salt.



As seen from the net ionic equation, this is a typical neutralization reaction, with $\text{Al}(\text{OH})_3$ as the base.

When an *excess* of sodium hydroxide solution (or any other strong soluble base) is added to solid aluminum hydroxide, the aluminum hydroxide dissolves. The equation for the reaction is usually written as



The total ionic and net ionic equations are

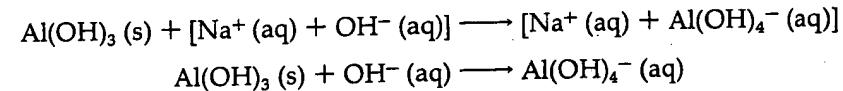


Table 9-6 contains a list of the common amphoteric hydroxides. Three are hydroxides of the metalloids.

3 Precipitation Reactions

Precipitation reactions are a common kind of *metathesis* reaction in which one of the products is an insoluble solid, called a **precipitate**, which separates from solution. An example is the formation of insoluble lead(II) iodide as a result of mixing solutions of the soluble ionic compounds lead(II) nitrate and potassium iodide.

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